ECS Collaborative Prototype Overview

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EOSDIS Core System

Science Office

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Outline

- Purpose and types of prototypes
- Goals of collaborative prototyping
- Current collaborative prototype activities
- ECS prototype testbed facility
- ECS announcement of opportunity
- ECS prototype infomration on WWW

Purposes of ECS Prototype Activities

- Mitigate Risk
- Clarify Requirements
- Enhance System Functions
- Assess Technology

Types of ECS prototypes

Position within Development

- Internal
- External
- Collaborative

Topical Category

- Engineering
- Technology
- Advanced

Goals of Collaborative Prototyping

- Solicit and incorporate user input to ECS development
- Address more user-sensitive issues

Current Collaborative Prototypes

- **Collaborating SCF's within an ECS end-to-end testbed: Exploring potential SCF-centric collaboration, integration and access**

  Collaborative with University of New Hampshire, Oregon State University, and Hughes Research Laboratory.

- **Digital Libraries as ECS Value-Added Providers**

  Collaborative with University of California, Santa Barabara, Alexandria Digital Library.

- **A Dataset-Independent Subsetting Prototype for the EOSDIS Core System**

  Collaborative with University of Alabama, Huntsville.

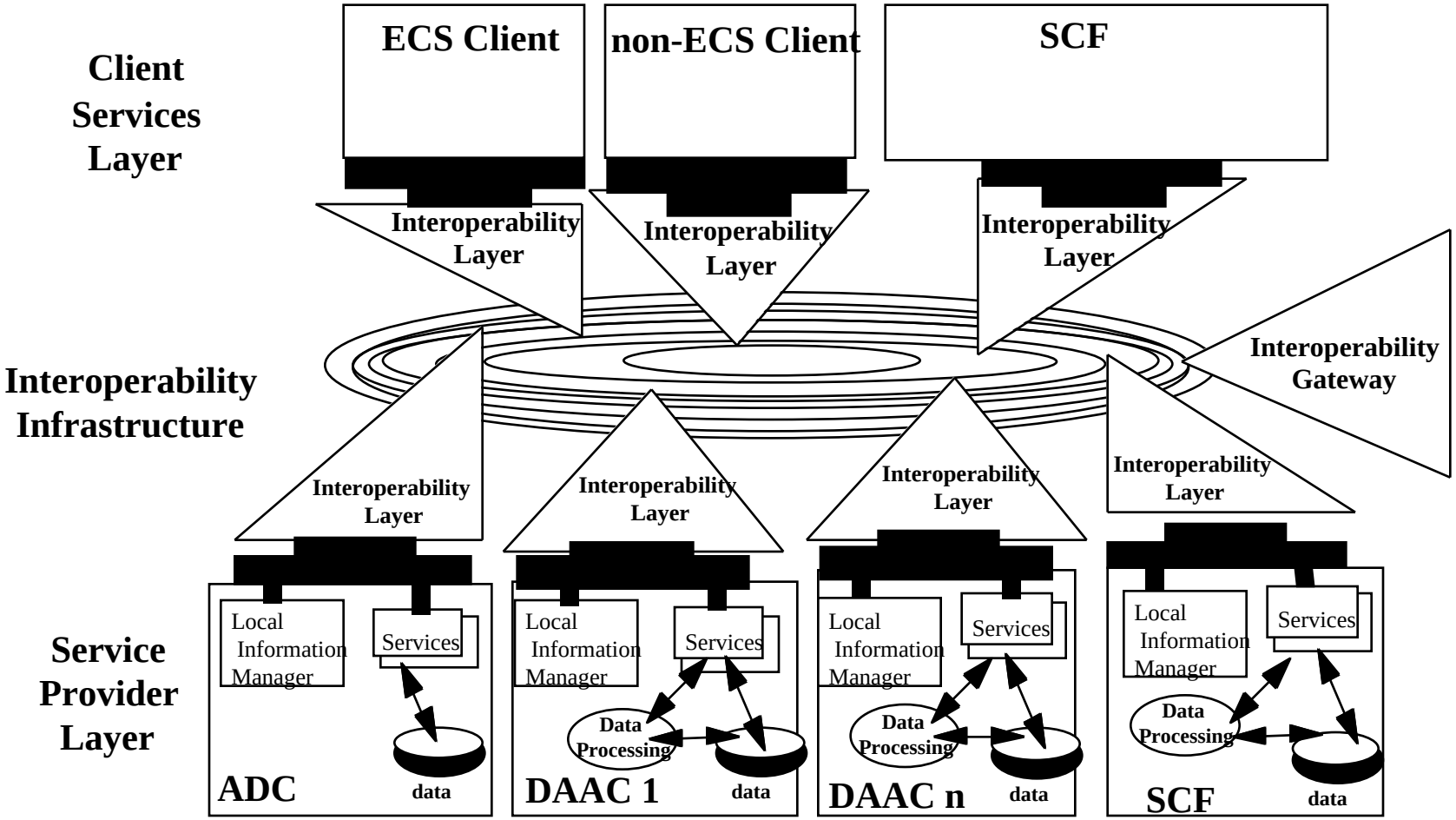
- **A Check-Pointing File Transfer Protocol - Restart/Recovery**

  Collaborative with University of Colorado, Boulder.

- **Prototyping the ECS Fault Management Application Service**

  Collaborative with University of Massachusetts, Amherst.

ECS Conceptual Architecture



The ECS Architecture can be thought of as a 3 layer model consisting of Cleint Services, Interoperability Infrastructure, and Service Provider, Respectively. ECS, Non-ECS; and SCF-specific clients “plug in” to an interoperability layer that connects them to a variety of Service Providers that potentially include the DAAC’s, the SCF’s and the affiliated data centers. New services, data, and even service providers can be added at any time. The interoperability layer provides the capability to identify and access seravices of interest.

Collaborating SCF's within an ECS end-to-end testbed: Exploring SCF-centric Collaboration, integration, and access.

A collaborative Prototype with University of New Hampshire, Oregon State University, and Hughes Research Labs

Berrien Moore, Mark Abbot, and Son Dao, Principal Investigators

Science

Science Objective

Develop a digital "virtual laboratory" linking an existing oceans laboratory with a terrestrial laboratory to support investigation of land/ocean interactions.

Science Context

Decline of salmon fisheries in the Pacific Northwest is an important and relevant EOS-era science topic.

Science Tasks

1) Study river plumes in coastal boundary with archived AVHRR and CSCS imagery

2) Compare with Landsat imagery and deforestation analyses provided through the UNH Pathfinder IMS to estimate forest removal during the CZCS observation window.

3) Quantify the relationship between plumes and forest clearing.

4) Expand, as feasible, to other data sets and other parts of the world

The ECS End-to-End Testbed

PROJECT OBJECTIVES

1) Explore SCF-DAAC integration and data access issues

- How will SCF's be integrated as value added service providers in a Multiple Provider Paradigm of EOSDIS?
- How will their databases be accessed and managed?
- What are the design constraints on, and the charateristics of, the potential tools for remote database access?
- Can tools be developed to access "external" relational, extended relational, and GIS databases?
- How can external COTS database technology (particulary ARC/INFOR GIS and Microsoft products) be integrated into EOSDIS

The ECS End-to-End Testbed

PROJECT OBJECTIVES (Cont.)

2) Explore SCF-SCF collaboration issues

- How will they access each others' services?
- What are the present possibilities for Computer Supported Collaborative Work (CSCW), given available telecommunications technology?
- What is the likely future in this area?
- What does the Web offer (ex. Forms interfaces, JAVA)?

The ECS End-to-End Testbed

PROJECT OBJECTIVES

UNH

- **Investigate the integration of GIS data into EOSDIS**
- Develop ARC/INFO IMS client and evaluate the enabled functions.
- Collaborate with HRL to “break” COTS GIS formats, evaluate non-COTS query and display options.
- Collaborate with HRL on schem integration
- Collaborate with OSU on database interoperability
- Evaluate options of CSCW, particularly satellite comm

The ECS End-to-End Testbed

PROJECT OBJECTIVES (Cont.)

OSU

- **Investigate the integration of external RDB into EOSDIS**
- Develop nonscientist Microsoft Access client and evaluate
- Develop Visual Basic/Excel client for integrated database query and quicklook analytical graphics
- Develop a scientist client based on Statistica
- Develop a WWW client; investigate technology limitations
- Collaborate with UNH on database interoperability
- Collaborate with HRL on schema integration

The ECS End-to-End Testbed

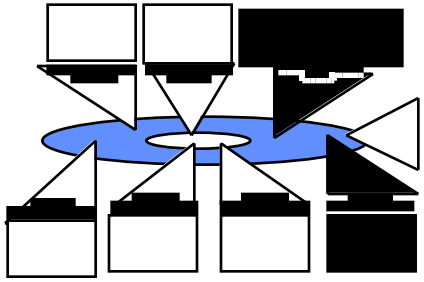
PROJECT OBJECTIVES (Cont.)

HRL

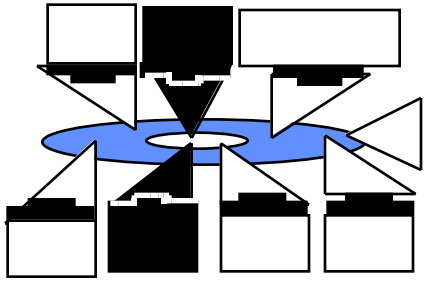
- **Lead schema integration investigations**
- Collaboration with OSU, UNH, and HRL on interoperability tasks
- Investigate limited replication of GIS functions
- Evaluate options for CSCW, satellite-based file transfer

The ECS End-to-End Testbed

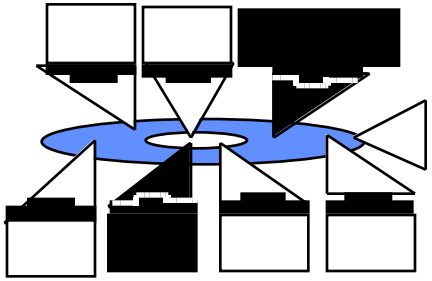
Client-Service Interaction Modes



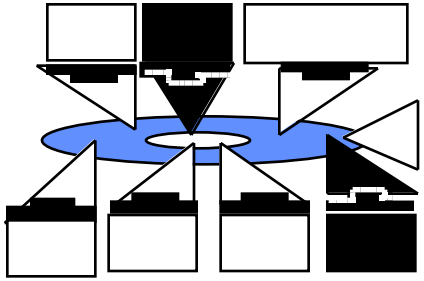
SCF to SCF Services



Non-ECS Client to DAAC Services



SCF to DAAC Services



Non-ECS Client to SCF Services

An important question concerns how the SCFs will interact with each other and with the DAACs. In turn, this question leads to questions of how non-ECS clients will interact with the DAACs and with the SCFs.

Digital Libraries as ECS Value Added Providers

A Collaborative Prototype with the
University of California, Santa Barbara,
Alexandria Digital Library

Jim Frew, Principal Investigators

Issue

How will the Digital Libraries of the future interact with EOSDIS as Value Added Providers (VAPs)

Evaluate and Analyze

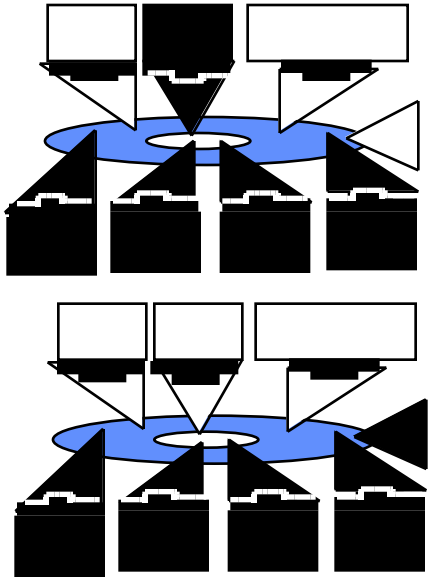
1) Impacts of the various VAP-ECS connection modes on search, access and distribution;
2) Relation to the ECS schema, data model, and APIs to the catalog, stroage, and distribution requirements of a digital library;
3) Possible improvements in the query, metadata, and data interfaces between ECS and external systems;
4) Specific interaction scenarios between ECS and external systems.

Approach

Build a prototype interface and the associated infrastructure allowing Alexandria Digital Library users access into EOSDIS through an interoperability gateway.

Digital Libraries

Client-Service Interaction Modes



Digital Library Client to ECS Services

Interoperability Gateway to ECS Services

A key question concerns how Digital Libraries will interact with ECS Services. The options include through a custom client or through the interoperability gateway.

A Dataset-Independent Subsetting Prototype For the EOSDIS Core System

A Collaborative Prototype with the University of Alabama, Huntsville,
Department of Computer Sciences
Sara Graves, Principal Investigator

Issues

Large volume datasets have the potential to exceed network capacity when downloaded by users.

In addition, users expect and require subsetting services in EOSDIS.

Objectiv e

Develop a rigorous dataset-independent subsetting service that supports subsetting by Space, Time and Parameter of HDF-EOS Point, Swath, and Grid Data Types.

Approach

1) Develop a top-level design for a Dataset Independent Subset Server (DISS) and a Dataset Independent Subset Client (DISC).
2) Generate and document sample data in HDF-EOS swath and grid formats.
3) Prototype the subsetting of these data to investigate suitability of the HDF-EOS formats and metadata for supporting subsetting by geographic region, time and parameter.
4) Peform detailed design and construction of a DISS and a DISC incorporating newly generated knowledge and community experience.
5) Perform testing of DISS and DISC with Release A datasets.

A Check-Pointing File Transfer Protocol: Restart/Recovery

A Collaborative Prototype with the University of Colorado, Boulder,
Bill Emery, Principal Investigator

Issues

Large file transfers commonly fail and there is no existing provision of recovery. EOSDIS could be hindered by this problem.

Objectiv e

Develop a practical and effective FTP restart/recover tool.

Approach

1) Investigate all existing restart/recover implementations;
2) Characterize actual failure mode context;
3) Examine potential solution alternatives collaboratively with experts;
4) Select the best solution methodology;
5) code solution and beta-test;
6) Locate ancillary code and combine with new code;
7) Adapt a solution to DOS and MAC clients;
8) Peform real-world end-to-end testing and distribute product.

Prototyping the ECS Fault Management Application Service

A Collaborative Prototype with the University of Massachusets,
Amherst,
Jim Dennison, Principal Investigator

Issues

Network diagnosis is a major challenge for EOSDIS. An ideal solution would allow prediction and avoidance of network faults before they occur, in addition to detection and repair.

Objectiv e

Identify and prototype solutions for identifying and evaluation network system faults using artificial intelligence methods.

Approach

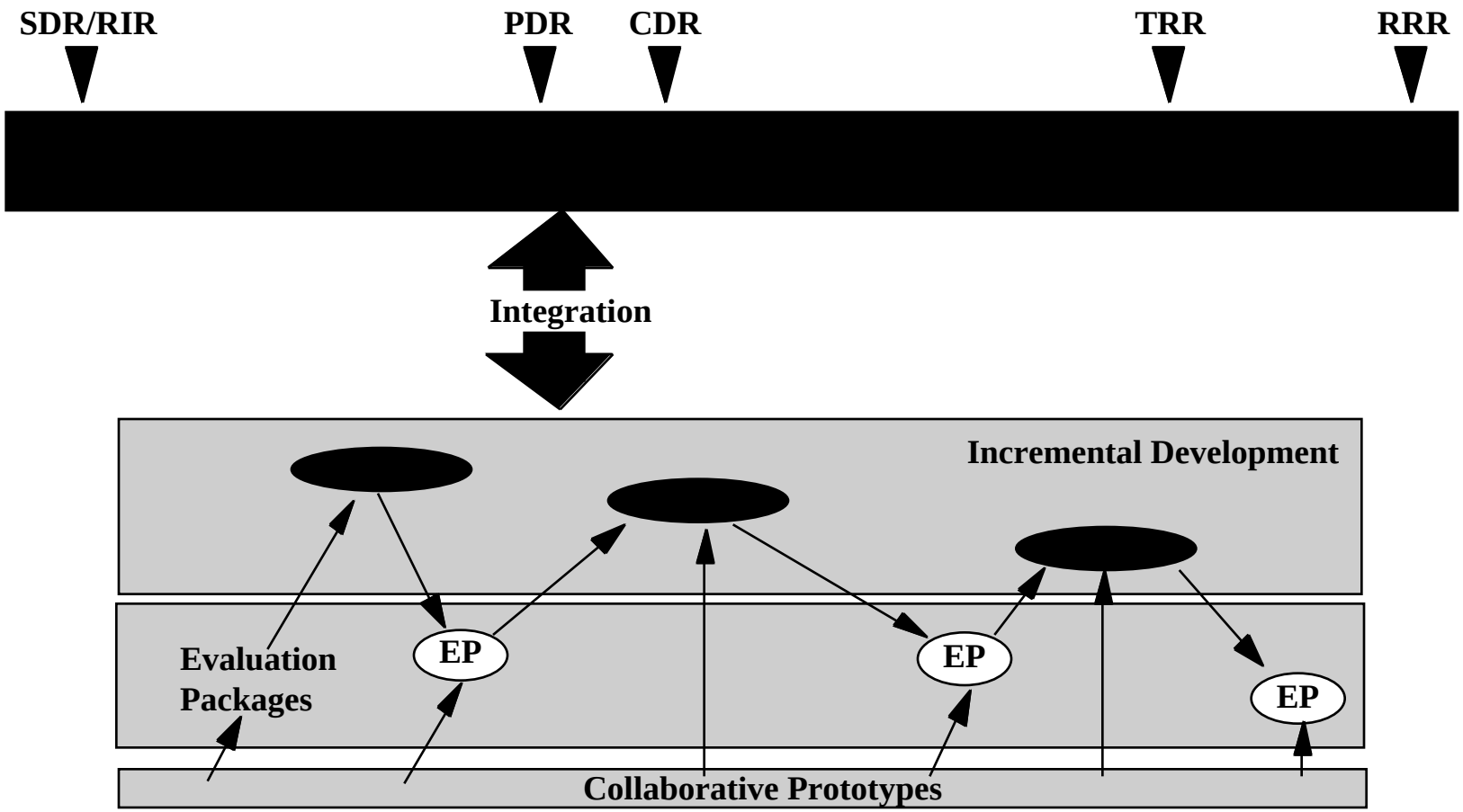
1) Perform through analysis of all components of the proposed ECS Fault Management Application Service (EFMA) and review of the literature.Produce a detailed design specification.
2) Prepare a simulation environment for prototype evaluation.
3) Create EFMAS domain model employing artificial intelligence methods applied to event occurence histories.
4) Develop an interface to b e used for interaction between the prototype and human operators (based on DAAC ops. model)

Prototyping the ECS Fault Management Application Service
(Cont.)

Approach (Cont.)

5) Perform an incremental implementation of EFMAS prototype employing a Multi-Stream Dependency Detection algorithm and expert system technology. This includes the development of capabilitities for fault monitoring, detection/isolation, diagnosis and repair.

Development Context of Collaborative Prototyping



Prototypes and Studies Steering Group

Revitalized Steering Group with scope of all relevant prototypes and stuides. Joint ESDIS/ECS ownership.

- **Manage the process for starting significant prototypes. Tie to key risks.**
- **Manage timely insertion of prototype-derived technologies into releases.**
- **Track these prototypes/studies in common fashion.**
- **Select some ESDIS and NRA/CAN work for integration into EP7--> RelB.**

ECS Technology Transfer Testbed Test and Evaluation Process

Admission to ECS Testbed test and evaluation process for a product which has comleted proof of concept stage

- Is forecast to have positive benefit/cost/risk impact
- Can be mapped to ECS domain
- Is ready to be tested
- Can feasibly run in ECS Testbed facility
- Has indication of user interest
- Is forecasted to be scalable/maintainable/sustainable

ECS Technology Transfer Testbed Test and Evaluation Process (cont)

Output of ECS Testbed test and evaluation process

Findings

- Benefits/Costs
- Interface analysis
- User Acceptance
- Maintainability
- Risk Impact
- Readiness
- Scalability
- Sustainability

Recommendations

- Yes/No/Partial/Conditional
- Insertion point identification

Future ECS Collaborative Prototypes

ECS Science Office will issue AO in Spring 1996. Topics will include:

- Alternative Clients (ex. Java)
- HDF-EOS file usability
- Federated provider interoperability
- GIS value-added providers
- Broadcast file delivery

ECS Prototype Information

- ECSinfo - http://ecsinfo.hitc.com